## REMARKS

Applicants appreciate the thorough examination of the present application that is reflected in the Official Action of November 5, 2003. Applicants also appreciate the Examiner's indication that Claims 2, 11, 13-14, 21, 29 and 31-32 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. These claims have not been rewritten in independent form because Applicants respectfully submit that all of the pending claims are patentable over U.S. Patent 5,705,959 to O'Laughlin in view of U.S. Patent 6,236,267 to Anzil, for the reasons that will now be described herein. For the convenience of the Examiner, the rejections will be addressed in the order in which they were made at Pages 2-6 of the Detailed Action.

**Claims 1 and 20 Are Patentable Over O'Laughlin In View of Anzil**

Claim 1 recites:

> 1. A modulation system comprising:
> a digital signal processor that generates in-phase, quadrature-phase and amplitude signals from a baseband signal;
> a phase locked loop that includes a controlled oscillator having a controlled oscillator output, the phase locked loop including therein a modulator that modulates the in-phase and quadrature-phase signals; and
> an amplifier having a signal input, an amplitude control input and an output, wherein the signal input is responsive to the controlled oscillator output and the amplitude control input is responsive to the amplitude signal.

Claim 1, and analogous method Claim 20 were rejected under 35 USC §103(a) over O'Laughlin in view of Anzil. However, Applicants respectfully submit that to establish a *prima facie* case of obviousness, three basic criteria must be met. The prior art reference or references when combined must teach or suggest *all* the claim limitations. There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings, and there must be a reasonable expectation of success of the combination. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found *in the prior art*, not in applicant's disclosure. See MPEP § 2143. As affirmed by the Court of Appeals for the Federal Circuit, to support combining references in a § 103 rejection, evidence of a suggestion, teaching, or motivation to combine must be *clear and particular*, and this requirement is not met by merely offering broad, conclusory statements about teachings of references. *In*

*re Dembiczak*, 50 USPQ2.d 1614, 1617 (Fed. Cir. 1999). In an even more recent decision, the Court of Appeals for the Federal Circuit has stated that, to support combining or modifying references, there must be particular evidence from the prior art as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed. *In re Kotzab*, 55, USPQ2d 1313, 1317 (Fed. Cir. 2000).

In particular, as noted above, Claim 1 recites:

> a digital signal processor that generates in-phase, quadrature-phase and amplitude signals from a baseband signal....

The Official Action contends at Page 2 that Figure 6 of O'Laughlin:

> "...illustrates an analog implementation of O'Loughlin invention in which input the single side band input (SSB) is generated by a quadrature modulation process as illustrated in figure 4. Referring to figure 6 again, the SSB signal g(t) is directed to an amplitude modulation (AM) envelope detector 66 and a phase detector 62. One skilled in the art would recognize that combination of figure 4, phase detector 62 and the AM envelope detector 66 would constitute the claimed digital signal processor.

However, Applicants respectfully wish to point out that O'Laughlin Figure 6 clearly relates to an analog implementation. See, for example, the brief description of Figure 6 at O'Laughlin Column 3, lines 15-16:

> FIG. 6 is a block diagram of an analog implementation of the invention.

Moreover, O'Laughlin is devoid of any description or suggestion of generating in-phase, quadrature phase and amplitude signals from a baseband signal. To the contrary, O'Laughlin's conventional low level SSB generator of g(t) 61 generates a single side band signal. Single side band is defined in O'Laughlin Column 4, lines 26-30 as follows:

> Another type of modulation is Single Side Band (SSB). This type of modulation suppresses one of the sidebands of an AM modulated signal which results in reduced frequency bandwidth in the Radio Frequency Spectrum.

Moreover, as noted in O'Laughlin Column 7, lines 10-13:

> In FIG. 6 the low power level information input signal f(t) is used to generate, by conventional, means a low level Complex Signal (such as an SSB signal) $g(t)=a(t)\cos[\omega_o t-f(t)]$.

Accordingly, O'Laughlin is also devoid of any description or suggestion of generating in-phase, quadrature phase and amplitude signals from a baseband signal, as recited in the above-quoted portion of Claim 1. In fact, O'Laughlin teaches away from generation of in-phase, quadrature phase and amplitude signals, because O'Laughlin's system begins with a

conventional low-level SSB generator of g(t) 61, so that a modulated single sideband signal is the starting point for O'Laughlin's entire system.

In order to supply the missing teachings, the Official Action cites Anzil at Page 2, as follows:

> Even though O'Loughlin teachings shows the SSB signal is generated by an analog implementation, however, as well known in the art, a digital signal processor, such as a Direct Digital Synthesis (DDS) circuit as shown in the second reference, can be used to generate in-phase and quadrature-phase signals

In this regard, however, Applicants wish to note that the second reference, Anzil, relates to a method and apparatus for linearizing an output signal which is generated by a power amplifier. See, for example, the Anzil Abstract:

> The present invention is a method and apparatus for linearizing an output signal which is generated by a power amplifier (PA). A phase compensation on the output signal is performed using a phase feed-forward path and a phase feedback path. An amplitude compensation on the output signal is performed using an amplitude feed-forward path and an amplitude feedback path. The amplitude compensation is synchronized with the phase compensation.

Thus, although Anzil Figure 1 does include a direct digital synthesizer DDS **132**, Anzil does not describe or suggest the generation of in-phase, quadrature-phase and amplitude signals from a baseband signal, as recited in the above-quoted portion of Claim 1, or their use as recited in Claim 1.

Applicants respectfully submit that it would not be obvious to combine O'Laughlin, which relates to a system and method for high efficiency, low distortion amplification of complex modulated radiofrequency signals, as noted in the O'Laughlin Abstract, with the *"Linearization for Power Amplifiers Using Feed-Forward and Feedback Control"* of Anzil, as noted in the Anzil Title. Moreover, even if combined, high efficiency low distortion amplification would be provided in O'Laughlin, using O'Loughlin Figure 6, and the power amplifier 65 of O'Laughlin would be linearized using feed-forward and feedback control using the system of Anzil. Even if combined, however, the combination would not describe or suggest "a digital signal processor that generates in-phase, quadrature-phase and amplitude signals from a baseband signal", as recited in Claim 1.

Claim 1 further recites:

> a phase locked loop that includes a controlled oscillator having a controlled oscillator output, the phase locked loop including therein a modulator that modulates the in-phase and quadrature-phase signals.

The Official Action concedes that neither the primary reference O'Laughlin nor the secondary reference Anzil describes or suggests a phase locked loop including therein a modulator that modulates the in-phase and quadrature-phase signals. See the Official Action, Page 3:

> O'Loughlin and Anzil teachings do not show the quadrature modulator is part of the PLL, however, the foregoing limitation could be easily implemented as a design choice.

Accordingly, the Official Action concedes that both references are devoid of any description or suggestion to include a modulator within the phase locked loop that modulates the in-phase and quadrature-phase signals. As noted in the present application, for example at Page 15, lines 3-16:

> According to other embodiments that will be described below in connection with Figures 14-22, modulation is applied within the phase locked loop itself. In particular, the phase locked loop includes a controlled oscillator having a controlled oscillator input and a controlled oscillator output, and a feedback loop between the controlled oscillator input and the controlled oscillator output. The feedback loop includes a mixer that is responsive to a local oscillator. In some embodiments, the modulator is placed in the feedback loop between the controlled oscillator output and the mixer, between the local oscillator and the mixer, or between the mixer and the controlled oscillator input. Accordingly, the modulation can be applied by modulating a local oscillator signal and leaving the IF as an unmodulated signal. Alternatively, the modulation can be applied to the RF output, and then mixed with an unmodulated local oscillator and IF frequency. In yet another alternative, the modulation may be performed after the mixer in the feedback path of the phase locked loop if it is desired to keep the IQ modulator running at the IF frequency.

Respectfully, the Official Action's rationale that the "foregoing limitation could be easily implemented as a design choice" does not provide the required clear and particular evidence to modify O'Laughlin or Anzil in the manner recited in Claim 1. Moreover, the rationale for combining as noted at Page 3 of the Official Action:

> O'Loughlin shows a general concept of the implementation, while Anzil disloses [sic] more component details.; [sic] therefore, combining both teachings would have been obvious for one of ordinary skill in the art,

does not provide the requisite motivation for combining references that is required by the MPEP and the case law described above.

There does not appear to be any motivation or suggestion in either of the references to combine the references or to modify the references to provide the recitations of Claim 1. Absent this motivation or suggestion, a *prima facie* case of obviousness is simply not shown, as noted by the above-described sections of the MPEP and the case law.

Accordingly, Applicants respectfully request withdrawal of the rejection of Claim 1. Claim 20 is a method analog of Claim 1 and is patentable for the same reasons that were described above. This analysis will not be repeated for the sake of brevity.

**Many of the Dependent Claims Are Independently Patentable**

Applicants appreciate the Examiner's indication that dependent Claims 2, 11, 13-14, 21, 29 and 31-32 are independently patentable. Moreover, Applicants respectfully submit that many of the other dependent claims are independently patentable for the following reasons:

Dependent Claim 3 recites:

> 3. A system according to Claim 1 wherein the in-phase and quadrature-phase signals are normalized in-phase and quadrature-phase signals, such that the modulated signal is a constant amplitude modulated signal

These claims are patentable as depending from independent Claims 1 and 20 for the reasons that were described above. Moreover, these claims are separately patentable. In particular, the Official Action states at Page 3 that:

> Regarding claims 3 and 22, normalization of the in-phase and quadrature-phase signals such that the modulated signal is a constant amplitude modulated signal is a design choice and could be easily implemented.

However, as was already described, there is no suggestion in either reference to generate in-phase, quadrature-phase and amplitude signals from a baseband signal, or to provide a phase locked loop that includes a modulator that modulates the in-phase and quadrature phase signals. Accordingly, there is certainly no motivation to provide normalized in-phase and quadrature phase signals, such that the modulated signal is a constant amplitude modulated signal. Moreover, the fact that the normalized in-phase and quadrature-phase signals may be "easily implemented" does not provide the requisite motivation that is required by the MPEP and the case law. For at least these reasons, Claim 3 and analogous method Claim 22 are independently patentable.

Claims 4 and 23, and Claims 5 and 24 are patentable at least per the patentability of the independent claims from which they depend. Moreover, these claims also are patentable at least per the patentability of Claims 3 and 22 from which they depend. This analysis will not be repeated for the sake of brevity.

**Claims 10 and 28 Are Patentable Over O'Laughlin In View of Anzil**

Independent Claim 10 recites:

> 10. A modulation system comprising:
> a quadrature modulator that modulates in-phase and quadrature-phase signals to produce a modulated signal;
> a phase tracking subsystem that is responsive to the quadrature modulator to produce a phase signal that is responsive to phase changes in the modulated signal and that is independent of amplitude changes in the modulated signal;
> an amplitude tracking subsystem that is responsive to the quadrature modulator to produce an amplitude signal that is responsive to amplitude changes in the modulated signal and that is independent of phase changes in the modulated signal; and
> an amplifier having a signal input, an amplitude control input and an output, wherein the signal input is responsive to the phase signal and the amplitude control input is responsive to the amplitude signal;
> wherein the phase tracking subsystem comprises a phase locked loop that includes a controlled oscillator having a controlled oscillator output that produces the phase signal and wherein the quadrature modulator is included within the phase locked loop.

These claims were rejected for the same rationale that was provided in rejecting Claims 1 and 20. Accordingly, Applicants respectfully submit that Claims 10 and 28 are patentable for the same reasons that were described above in connection with Claims 1 and 20. This analysis will not be repeated for the sake of brevity. Similar analysis applies relative to analogous method Claim 28.

**A New Abstract Is Being Supplied**

A replacement page for the Abstract is being filed concurrently, wherein the title is eliminated.

**Conclusion**

Applicants again appreciate the Examiner's indication that Claims 2, 11, 13-14, 21, 29 and 31-32 would be allowable. Applicants respectfully submit, however, that independent Claims 1, 20 and 28 also are allowable for the reasons that were described above. Moreover, many of the other dependent claims are independently patentable for

the reasons that were described above. Accordingly, Applicants respectfully request withdrawal of the outstanding rejections and allowance of the present application.

Respectfully submitted,

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